CLAIMS

We claim:

1. A microchannel mixing device for electrohydrodynamic mixing of fluids, comprising:

a mixing channel, said mixing channel having an inlet for receiving at least one fluid;

at least one supply channel fluidicly connected to said mixing channel inlet for transport of said fluid into said mixing channel inlet, and

at least two electrodes for imposing an electric field in said mixing channel, at least one of said electrodes adapted for charging at least a portion of said fluid.

2. The mixing device of claim 1, wherein said at least one supply channel comprises a first supply channel for a first fluid and a second supply channel for a second fluid.

3. The mixing device of claim 2, wherein at least one of said electrodes is disposed within said first or second supply channels.

4. The mixing device of claim 1, wherein at least one of said electrodes is a fluid isolated electrode disposed in a location which is not in contact with said fluid.

5. The mixing device of claim 1, wherein said mixing device further comprises a cover plate in contact with a substrate.

6. The mixing device of claim 5, wherein said mixing channel and supply channel are formed in said cover plate.

7. The mixing device of claim 5, wherein said cover plate is gas permeable.

8. The mixing device of claim 5, wherein said substrate comprises silica or glass.

9. The mixing device of claim 1, further comprising at least one power supply for applying a DC, pulsed DC or AC voltage to any of said electrodes.

10. The mixing device of claim 9, wherein said power supply comprises at least two independent power supply channels.

11. The mixing device of claim 2, wherein said first and second fluids are mixed in said mixing channel, wherein at least one product is formed from a reaction.

12. The mixing device of claim 1, wherein said electrodes are positioned along a length of said mixing channel, wherein a potential difference applied between said electrodes produces an electric field oriented substantially parallel or anti-parallel to a direction of flow of said fluid in said mixing channel.

13. The mixing device of claim 1, wherein said electrodes are positioned transverse to a length of said mixing channel, wherein a potential difference applied between said electrodes produces an electric field oriented substantially transverse to a direction of flow of said fluid in said mixing channel.

14. A method for electrohydrodynamically mixing fluids, comprising the steps of:

delivering at least one fluid into a mixing channel;

inducing a charge on at least a portion of said fluid; and

applying an electric field across at least a portion of said mixing channel, wherein at least one of said fluid is mixed.

15. The method of claim 14, wherein said electric field originates or terminates outside said mixing channel.

16. The method of claim 14, further comprising the step of releasing gas evolved from said applying step.

17. The method of claim 16, wherein said releasing step comprises diffusion across a gas permeable layer.

18. The method of claim 14, wherein said applying step comprises application of a DC voltage.

19. The method of claim 14, wherein said applying step comprises application of a time varying voltage signal.

20. The method of claim 19, wherein said time varying voltage signal comprises a pulsed DC signal.

21. The method of claim 14, wherein said applying step comprises applying voltage using at least two independent power supply channels.

22. The method of claim 14, wherein said electric field applied is substantially parallel or anti-parallel to a direction of flow of said fluid in said mixing channel.

23. The method of claim 14, wherein said electric field applied is oriented substantially transverse to a direction of flow of said fluid in said mixing channel.